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How to cite:

Okada, Alexandra; Scott, Peter and Mendonca, Murilo (2015). Effective web videoconferencing for proctoring online oral exams: a case study at scale in Brazil. Open Praxis International Journal, 7(3) pp. 227–242.

For guidance on citations see FAQs.

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Version: Version of Record

Link(s) to article on publisher's website:
http://dx.doi.org/doi:10.5944/openpraxis.7.3.215
http://www.openpraxis.org/index.php/OpenPraxis/article/view/215/173

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Open Praxis, vol. 7 issue 3, July–September 2015, pp. 227–242 (ISSN 2304-070X)

OPEN PRAXIS
INTERNATIONAL COUNCIL FOR OPEN AND DISTANCE EDUCATION

Effective web videoconferencing for proctoring online oral exams: a case study at scale in Brazil

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Abstract

The challenging of assessing formal and informal online learning at scale includes various issues. Many universities who are now promoting "Massive Online Open Courses" (MOOC), for instance, focus on relatively informal assessment of participant competence, which is not highly 'quality assured'. This paper reports best practices on the use of a web videoconferencing application to quality control student assignments through online oral examination at scale. In this case study, we examine the use of a simple online conferencing technology FlashMeeting (FM) by a Brazilian University to provide 'quality assurance' in the assessment of twelve online postgraduate courses in Law for 20,000 students. Our research questions investigate the benefits and recommendations of using FM in online oral exams at scale. Our qualitative and quantitative data analysis centres on 3,462 short format interviews through FM conducted for this purpose by a group of around fifty assessors from September 2008 to September 2012. The effective use of FM provided evidence with respect to high quality assurance recognised by the Institution with respect to: students' identity, their knowledge and ownership of written work. The key benefits identified from the perspective of assessors and students were: reliable examination, credible technology, authentic assessment, interactive e-Viva, low cost, scalable process and practical testing in terms of time, effort and money.

Keywords: Assessment at scale; quality assurance; videoconferencing; Massive Online Open Courses; Higher Education; oral online exams; e-Viva

Introduction

The issue of quality assuring the work of a remote student has been a long-standing challenge to Distance and Open Universities (Gaytan, 2005; Robles & Braathen, 2002). Most of these organizations still place an emphasis on summative exams in a controlled physical proctored location (Hollister & Berenson, 2009; Harmon & Lambrinos, 2008; Wynne & Lopes, 2006). A human proctor in a physical exam centre manually checks the student identity paperwork before the student is invited to complete a short time length 'hidden paper' examination. Many proctoring centres and technologies are now commercially available. Their aim is to add a quality assurance element in 'observing and recording' the student during the exam on a 'locked down' computer via a webcam to reduce the temptation to cheat during the hidden paper test.

The examination paper is presented in this way because it can be guaranteed to be the student's work due to the physical constraints of the exam venue. The venue may be in many different world locations, the exam may even be on a 'locked down' networked computer to allow rapid submission of the work, but the management of the process would be recognizable to someone examining two centuries ago. However, the assessment challenge has now broadened to many more organizations in conventional universities who are now promoting "Massive Online Open Courses" (MOOC) online.

Reception date: 30 April 2015 • Acceptance date: 13 July 2015
DOI: http://dx.doi.org/10.5944/openpraxis.7.3.215

These are aimed at a very large-scale student learning experience, and currently focus on relatively informal assessment of participant competence, which is not highly 'quality assured' such as a 'badge' based (Cross, Whitelock & Galley, 2014) on a multiple choice quiz (Perna *et al*., 2014). As MOOC provision matures, the issue of providing 'high stakes' examining for the learner experience (Koller, Ng, Chuong & Chen, 2013) is gaining focus—in particular because the certification component of a MOOC offers a possible business-model driven by "for fee" element in an otherwise free and open system.

The value of any certificate must rest on a number of quality assurance issues: Did the student actually attend the course, and contribute? Did the student submit assignments and answer questions alone or with the assistance of others? Is the student able to demonstrate the competences that the course aims to teach? A range of work has sought to ensure student compliance with the course structure, from simple systems that require a student to manually check the completion of each 'course page' in the online learning environment, to research into systems, which require students to constantly confirm their attention during the replay of recorded lectures (Canessa, Tenze & Salvatori, 2013). Of course, ensuring that a student has been exposed to the offered teaching material does not assure that anything has been learned. At higher levels, certainly, a preferred technique is to use 'low stakes' continuous assessment through the teaching. Short answers or multi-choice questions, for instance, allow the quicker student to skip content they find easy whilst still confirming their competence as they move through the material. In all such cases, 'raising the stakes' in e-Assessment is clearly a challenging topic in education both through the more effective use of technology and in re-thinking the nature of the examination itself.

The use of remote videoconferencing to reduce the cost and complexity of face-to-face physical meetings is understandably popular. Indeed, webcam videoconferencing technology is now very common for many meeting formats, with a wide range of robust technical systems such as Skype™ and Apple's FaceTime™ and with cameras now commonly built into many computers, tablets and phones. In contrast, for events which are considered "high stakes", i.e. where the process of the meeting can be complex and the outcome is very significant to participants, the replacement of the physical with the virtual has been slower. For 'high stakes' outcomes such as job interviews, the potential has been explored as the technology has matured, and early reservations (Kroeck & Magnusen, 1997) are being overcome. For example, a compelling case shows that short online video interviews are just as effective in student selection for a graduate entry programme as the much more expensive, face-to-face equivalent (Tiller *et al*., 2013). However, whilst video interviews are now in use for testing and validating performance effectively, for instance in language exams, users are still reporting concerns over increased stress of the online performance, over how they might feel about face-to-face assessment, and concerns about the technical set up, use of 'recording' features and need for effective technical support for the technology (Kim & Craig, 2012). In all these examples, there are still concerns about the quality assurance of the online event relative to the physical, and the different pressures it may place upon the participants.

The face-to-face *viva voce* examination remains a 'gold standard' for testing a student's knowledge of a body of work. It is particularly popular in higher degree programs in which the examiner can spend time to interrogate a student with respect to a written submission they have made, often a thesis or dissertation. One valuable attribute of an oral examination, in combination with a written submission, is that it can be used by an expert examiner to both probe the students' knowledge of topics which were not covered well in the written submission, but most especially that it offers a quality assurance opportunity to test the students 'ownership' of the submitted work, and to reduce the risk that the claimed work is actually that of another.

As a high-quality procedure, the oral examination is typically reserved for 'very high stakes' examining due to its cost and complexity to organize and manage—requiring a physical meeting of the student and the expert examiner, plus often the need to host an observer (to witness the process and to accommodate any 'appeal' claim that may later arise). In particular, because the examiner is scheduled with one student at a time, this generally rules it out of any large-scale process due to the expense of the examiner's time and physical logistics of meeting with each student to discuss their work. If a model of videoconferencing use could be applied to bring the gold standard to a wider use at scale that might be very compelling.

In this study, a significant number of online oral examinations are analysed, including quantitative data provided by the FM web conferencing application as well as qualitative feedback from students, examiners, supervisors and course coordinator. Our investigation centres on "how can we assure the quality of a large-scale, low cost and flexible distance education online assessment?" The objectives of this investigation are to discuss not only advantages and challenges of oral exams through a web videoconference application, but also suggest recommendations grounded on best practices. This investigation therefore aims to address these questions:

- Can online videoconferencing technology be effectively used as a quality assurance mechanism in a scaled, low cost and flexible way for distance education? What are the requirements and suggestions?
- What are the key benefits and success factors in the effective deployment of online video supported viva-voce examinations?
- What would be the expected barriers and challenges to QA in a distance assessment context?

Research context: case study in Brazil

The case study focuses on the education network LFG, 'Luiz Flávio Gomes', which has partnered with UNISUL, *Universidade do Sul de Santa Catarina*, for providing the following online postgraduate programmes in Law:

1. Constitutional Law
2. Public Law
3. Civil Procedural Law
4. Social and Practical Function of Law: Public Law
5. Social and Practical Function of Law: Tax Law
6. Criminal Sciences
7. Tax Law
8. Procedural Law: Great Transformations
9. Notary and Registry Law
10. Social Function of Law: Procedures, Constitution and New Rights
11. Election Law
12. Constitutional Limits of Investigation in Brazil

The agreement between UNISUL and LFG was in force from 2005 to 2008. More than 20,000 students registered for the Law programmes offered. In compliance with the rules and regulations of the State Council of Education of Santa Catarina and the National Council of Education, vivas were initially optional and later compulsory for two of the programmes, namely Public Law and Civil Procedural Law.

The certificates of students who opted for a viva bore a reference to the rules and regulations of the State and of the National Council of Education. For those who chose not to have a viva, these

certificates bore a reference to the rules and regulations of the State Council of Education only. The certificates of the students enrolled in the programmes which required a viva bore a reference to the rules and regulations of both the State and the National Council of Education and those students who did not show up for the compulsory viva were not approved and, therefore, were not issued with a certificate.

Every semester, registration was open to each of the above-mentioned programmes with a minimum requirement of 100 students registered per programme. In some cases, the number of students registered per programme was as high as 1,600. The duration of these programmes was one year and a half.

The pedagogical methodology adopted by LFG-UNISUL focused on online-based and telepresence courses grounded on four key features: synchronous and asynchronous content delivery, continual online learning support, written and oral e-assessment as well as two possibilities of certification, namely Training for the Job Market (with 360 contact hours) and Higher Education Teacher Training (with 450 contact hours). The two modalities shared the same curriculum and the Higher Education Teacher Training Certificate had two additional courses each with 45 contact-hours:

1) Research Methodology; and
2) Higher Education Methodology.

Course content

A team of external professors and professional specialists in Law was responsible for running telepresence lectures once a week as well as developing the learning content. Students would participate in the tele-lectures at the regional centre located closest to their work or home. They were also registered in the virtual environment denominated EVA (*Espaço Virtual de Aprendizagem*) —Learning Virtual Space, of UnisulVirtual. In the EVA, they could access learning materials as well as group activities, optional individual exercises and discussion forums.

Learning support

The UnisulVirtual team responsible for these programmes consisted of 40 lecturers, 7 programme co-ordinators, 14 student support staff and 30 clerical and technical staff. Learning support was offered by the lecturers in the EVA and other kinds of support were provided by the Student Support Team either in the EVA or by telephone. Pedagogical support was also offered during the learning activities in the EVA as well as during the supervision and assessment of students' final papers at the end of the programme.

E-assessment

The key aspects for assessing students were quality of learning outcomes, authenticity and tele-lecture attendance control. The assessment system was based on online assignments and/or exams as well as a final exam through web videoconferencing based on safety precautions for ensuring the reliability and credibility of results. E-assessment for each course included all activities available in the EVA (including a distance exam), and a face-to-face exam. At the end of the programme, students had to produce a final paper—with its oral defence through an online viva required by only two of the programmes: Public Law and Procedural Law: Great Transformations. The lecturers were responsible for mediating the teaching and learning processes and also for motivating students and creating learning opportunities. They could be reached through the EVA to provide students with guidance during the activities of each course or module. They were also in charge of formulating

and grading exams. The Student Support Team was responsible for giving students technical, administrative and, occasionally, motivational support.

The online viva process involved a group of fifty three lecturer-examiners from UNISUL. The examiners were provided with a 'pre assessed' final paper for each student, and were briefed that their primary purpose was to confirm that the paper was the work of the submitting student. The paper itself was to have been already graded by the final paper supervisor before the date of the scheduled oral exam. Examiners should only confirm students' identity and probe their knowledge of the submitted work to 'quality assure' the submission. Furthermore, each session was 'auto recorded' to a unique coded URL hosted on the event server (this being a default feature of the FM service). The recording was deemed to be 'co-owned' by both the student and the institution and was not to be edited by either party. Ergo, the student was at liberty to review her/his performance at any time and indeed to share it with family or friends at their discretion. Equally, the institution could use the recording to confirm and cross-check any unresolved identity issues, but also the student could use the recording as evidence in any appeal.

Certification

Students were issued with a Postgraduate Certificate provided that: they had attended at least 75 percent of the tele-lectures in the regional centres; they had obtained no grade under "C" in any of the courses during the programme; their final papers had obtained a passing grade; and they had obtained a passing grade after the viva in the case of the two programmes which required an oral defence of the final paper. The weightings of the exams held for each course were as follows: distance exams/assignments/VLE activities (40 percent); face-to-face exam (60 percent).

Vivas were conducted via the web videoconferencing tool called FlashMeeting (FM), developed by KMI—the Knowledge Media Institute of the Open University UK—and could last no longer than 30 minutes. Students' presentations of their final papers could last up to 20 minutes and the remaining minutes could be used for answering questions if necessary. The requirements for the oral presentation were a clear identification of the student through a webcam as well as clear sound during their presentation for the examiners. Students were told that the presentations were recorded and that they would be accessible at any time. In case of fraud the FM replay can be used as a proof. The student received the URL of their presentation and they were allowed to share them with their colleagues and family. In order to be approved, students must be able to show the knowledge presented in their written papers.

The viva was compulsory for the programs of Public Law and Procedural Law but optional for the other programmes.

The UNISUL staff confirmed that students were carefully instructed with respect to the objectives of the e-Viva, for example, to:

- Confirm their authorship of the written assessed work under consideration;
- Prove that their identity in the e-Viva was a match with the name on the written work;
- Demonstrate that they know the content of the submitted work.

Students and staff confirmed that they understood the requirements to succeed in the e-Viva: (a) that they could use the minimum infrastructure—webcam and audio; (b) that they would be expected to interact with the examiner, answering questions during a 30 minute 'booked' online event; (c) that the minimum 'acceptable interaction' time would be 15 minutes, of the 30 minute slot—to allow for any technical issues; (d) that the assessors should be objective and the students should provide complete answers; (e) and that any participant could attend the e-Viva from any location, e.g. from home, a local 'LAN house' or at a Learning Centre.

Research design: approach and technology

This case study is based on qualitative and quantitative data analysis of 3,462 short format interviews through the FM web videoconferencing technology conducted for this purpose by a group of around 40 assessors from September 2008 to September 2012. A total of 3,205 vivas were held which included rebooking of events, out of which 1,300 were compulsory and 1,905 were optional during the period of September 2008 to September 2012.

FM is a web video conferencing system, which has come from the FlashMeeting project (http://flashmeeting.com) hosted at the UK's Open University (Scott, Tomadaki & Quick, 2007). FM events are fixed in time, and therefore must be booked. The system generates a unique web URL for each event, which acts as a key to the live meeting, when circulated to meeting attendees, who simply click on the link to gain access to the videoconference. Attendees do not need to be registered in the system or have an account to participate. The controls to the system are very simple, and typically FM does not require any additional downloads to an up-to-date web browser. Generally, events are set to "auto record" on the server, and those recordings are available via the same URL as the live event, so that a participant in the live meeting already has 'the key' to the recording. FM recordings can be edited, annotated and syndicated—but these features were not used in this scenario. The application provides a 'push-to-talk', simple audio/video broadcasting which allows only one person to speak at any one time; with a hand-up to talk model to speak in which the current 'speaker' chooses when to hand over to any requesting user. There is a parallel text chat channel in which any participant may type during the event.

Figure 1a: the "live view" of an FM e-Viva event with a chat area.

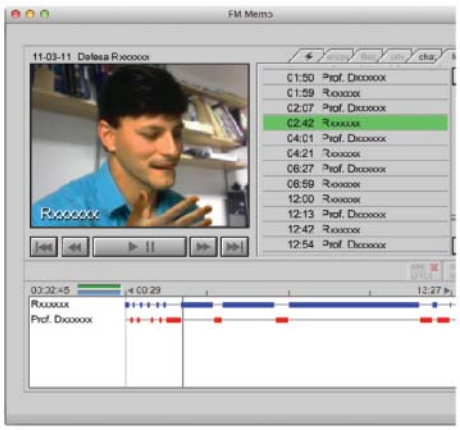

Figure 1b: the "recorded view" of an e-Viva event with its timeline.

Figure 1 presents two screenshot views of an e-Viva event which was conducted 11th March 2011. They show a view as the participants would have seen it live (figure 1a) and how the same event would appear as a recording (figure 1b). (Note the images of participants have been replaced and the names obscured with 'xxxx' to preserve anonymity; but all other features remain unedited). In figure 1a we can see that the examiner (here designated as Prof Dxxx) is addressing the student, and the student (designated Rxxx) has raised a hand to respond. Figure 1a is presented from the student's point of view, and shows that the examiner is speaking with more than twelve minutes of the 'booked time' remaining. However, she has already typed the only text chat line, which was used in this particular event: "*aprovada*", meaning 'you passed', so is probably drawing this e-Viva to a close. In the recording (figure 1b) we can see an earlier moment in the event (elapsed time is 2 min. 42s.', indicated by the segment highlighted to the right of the screen, and the 'playback line'

in the bottom visualization starting to play the student's first long answer (the horizontal bars in the Rxxx line being the student speaking). This event can be replayed by anyone who has the URL and users who are administrators in the FM can also export the meeting to an audio file, which might be used for transcription.

In FlashMeeting, the metadata produced after each meeting can be used to interpret the event in different ways (see Figure 2). For example, these different kinds of events may contain different communication patterns, which can be interpreted in different sense-making representations. These graphs can be a timeline of the meeting visualization or the event shape graphics, which can be grouped by events of an online community (Okada, 2008). The IP resolutions of FlashMeeting users include information about the use of the tool by different communities. Using people's IP addresses, their location can be plotted on a world map. In this way, maps can be generated to show the distribution of users for both the attendance of live FlashMeetings and FlashMeeting replay access. For example, the IP resolution of the users connected to the live FlashMeetings shows how the tool is being used to connect people from the same social network or community of practice, while the IP resolution of the users viewing a public replay shows the learning impact of the event reuse in different parts of the world (Okada, Tomadaki, Buckingham & Scott, 2008).

	B	C	D	F	G	H	I	J	K	L
1	Event	Date	Duration	Chat Msg	Users	Names of users	IP	IP Map URL	Replays	Title
2	0e650f-9350	Fri, 09 Oct 2009 19:00:0	00:00:00	1	1	MSc. Surana Pretto	27	http://fm-openlearn.open.ac.uk/fn	14	Sala de Tortar para ar Defarar Orair TeleVirtuair de Manaqrafia LFG
3	90085e-9159	Fri, 02 Oct 2009 20:30:	00:00:01	1	1	Profa. MSc. Patricia Fantanella	19	http://fm-openlearn.open.ac.uk/fn	2	Defara Oral de Manaqrafia TeleVirtual LFG de Cienciar Penair.
4	e19cbe-9661	Thu, 03 Sep 2009 14:20	00:00:02	0	0		33	http://fm-openlearn.open.ac.uk/fn	1	Sala de Tortar para ar Defarar de Manaqrafia LFG
5	7f9027-16975	Tue, 17 Aug 2010 14:00:	00:00:02	2	1	Prof. Hélia Herzmann	2	http://fm-openlearn.open.ac.uk/fn	0	Defara Oral TeleVirtual de Manaqrafia LFG Direita Tributaria.
6	c02812-7353	Thu, 02 Jul 2009 12:30:	00:00:03	0	0		14	http://fm-openlearn.open.ac.uk/fn	10	Defara Oral TeleVirtual de Manaqrafia LFG - Direita Canstitucianal.
7	e2fc1-8799	Thu, 17 Sep 2009 22:30	00:00:03	0	0		2	http://fm-openlearn.open.ac.uk/fn	0	Defara Oral de Manaqrafia TeleVirtual LFG - Direita Tributaria.
8	f3bc31-9977	Wed, 28 Oct 2009 20:0	00:00:03	0	0		9	http://fm-openlearn.open.ac.uk/fn	1	Defara Oral de Manaqrafia LFG
9	476727-14234	Tue, 09 Feb 2010 17:30:	00:00:03	0	0		47	http://fm-openlearn.open.ac.uk/fn	3	Tarte Nava Laboratoria para ar defarar.
10	5fa7b2-15571	Wed, 31 Mar 2010 19:30	00:00:03	0	0		47	http://fm-openlearn.open.ac.uk/fn	2	Defara Oral de Manaqrafia TeleVirtual LFG
11	5b7af2-6258	Tue, 31 Mar 2009 19:30	00:00:05	20	2	Prof. MSc. Gustavo Silvia, OLAVO	29	http://fm-openlearn.open.ac.uk/fn	0	Defara Oral de Manaqrafia TeleVirtual LFG de Cienciar Penair.
12	5f9a38-14104	Thu, 04 Feb 2010 16:30:	00:00:06	0	0		31	http://fm-openlearn.open.ac.uk/fn	0	Defara Oral de Manaqrafia TeleVirtual LFG de Cienc
13	cbb7ee-9162	Fri, 02 Oct 2009 22:00:	00:00:08	9	2	Cleberzan, Profa. MSc. Patricia Fant	6	http://fm-openlearn.open.ac.uk/fn	0	Defara Oral de Manaqrafia TeleVirtual LFG de Cienciar Penair.
14	67a94e-15074	Thu, 18 Mar 2010 23:00	00:00:08	0	0		25	http://fm-openlearn.open.ac.uk/fn	416	Defara Oral de Manaqrafia TeleVirtual LFG de Cienciar Penair.
15	aebde1-4241	Fri, 19 Sep 2008 17:30:0	00:00:10	1	1	Fabia Halthauren	20	http://fm-openlearn.open.ac.uk/fn	2	Defara Oral de Manaqrafia TeleVirtual LFG de Direita Publica
16	7f1f4e-14218	Mon, 08 Feb 2010 16:30	00:00:10	0	0		20	http://fm-openlearn.open.ac.uk/fn	2	Defara Oral TeleVirtual de Manaqrafia LFG de Direita Canstitucianal.
17	900234-4980	Mon, 01 Dec 2008 11:30	00:00:11	0	0		12	http://fm-openlearn.open.ac.uk/fn	2	Defara Oral de Manaqrafia TeleVirtual LFG de Direita Canstitucianal.
18	edbeee-6681	Wed, 06 May 2009 10:2	00:00:11	0	0		33	http://fm-openlearn.open.ac.uk/fn	5	Defara Oral de Manaqrafia TeleVirtual LFG
19	142247-15009	Tue, 16 Mar 2010 13:00:	00:00:11	2	1	Fabia Halthauren. Prof. Mo.	24	http://fm-openlearn.open.ac.uk/fn	0	Sala de Tortar para ar Defarar de Manaqrafia
20	061201-4237	Fri, 19 Sep 2008 10:30:0	00:00:12	4	2	Prof. Fábia Halthauren, darley julia b	40	http://fm-openlearn.open.ac.uk/fn	7	Defara Oral de Manaqrafia TeleVirtual LFG de Cienciar Penair.
21	4d152f-6175	Thu, 26 Mar 2009 10:30	00:00:12	1	1	MSc. Carina Milioli	47	http://fm-openlearn.open.ac.uk/fn	6	Defara Oral de Manaqrafia TeleVirtual LFG - Direita Tributaria.
22	2efc12-14579	Fri, 12 Feb 2010 17:00:0	00:00:12	0	0		29	http://fm-openlearn.open.ac.uk/fn	7	Defara Oral TeleVirtual de Manaqrafia LFG de Direita Canstitucianal.
23	908d52-14930	Wed, 10 Mar 2010 18:00	00:00:14	0	0		20	http://fm-openlearn.open.ac.uk/fn	2	Defara Oral de TeleVirtual de Manaqrafia LFG de Cienciar Penair
24	04834b-9782	Tue, 27 Oct 2009 19:30	00:00:15	4	1	Fabia Halthauren. Prof.	17	http://fm-openlearn.open.ac.uk/fn	5	Defara Oral TeleVirtual de Manaqrafia LFG de Cienciar Penair
25	5c79f5-8612	Fri, 18 Sep 2009 15:00:0	00:00:20	1	1	Vandelei Clerar da Silva	58	http://fm-openlearn.open.ac.uk/fn	1	Defara Oral de Manaqrafia TeleVirtual LFG de Cienciar Penair.
26	50a3a2-15480	Thu, 25 Mar 2010 12:10:	00:00:20	2	1	Profa. MSc. Patrícia Fantanella	27	http://fm-openlearn.open.ac.uk/fn	1	Defara de Manaqrafia
27	268f18-9975	Wed, 28 Oct 2009 19:0(	00:00:21	0	0		23	http://fm-openlearn.open.ac.uk/fn	2	Defara Oral TeleVirtual de Manaqrafia LFG de Direita Canstitucianal.
28	37f832-11540	Fri, 27 Nov 2009 10:30:	00:00:22	1	1	Prof MSc Giovani de Paula	12	http://fm-openlearn.open.ac.uk/fn	3	Defara Oral TeleVirtual de Manaqrafia LFG de Cienciar Penair.
29	091226-14173	Mon, 08 Feb 2010 20:3(	00:00:22	3	2	profa. Mrc. Patrícia Fantanella, Pala	11	http://fm-openlearn.open.ac.uk/fn	0	Defara Oral TeleVirtual de Manaqrafia LFG de Direita Canstitucianal.
30	93a7ee-4805	Thu, 13 Nov 2008 19:00	00:00:23	0	0		27	http://fm-openlearn.open.ac.uk/fn	2	Defara Oral TeleVirtual de Manaqrafia LFG de Direita Canstitucianal.
31	4abef2-9101	Thu, 01 Oct 2009 22:30	00:00:23	1	1	Prof. MSc Frederico Pedro Cardara	13	http://fm-openlearn.open.ac.uk/fn	2	Defara Oral TeleVirtual de Manaqrafia LFG de Direita Canstitucianal.
32	ae19c8-8796	Thu, 17 Sep 2009 21:00	00:00:27	0	0		29	http://fm-openlearn.open.ac.uk/fn	3	Defara Oral TeleVirtual de Manaqrafia LFG de Direita Tributaria.
33	fcaa56-16085	Fri, 30 Apr 2010 21:00:(	00:00:28	0	0		28	http://fm-openlearn.open.ac.uk/fn	2	Defara Oral TeleVirtual de Manaqrafia LFG de Cienciar Penair.
34	f05830-12701	Mon, 30 Nov 2009 18:3(	00:00:29	3	1	Fabia Halthauren. Prof. Mo.	40	http://fm-openlearn.open.ac.uk/fn	0	Defara Oral TeleVirtual de Manaqrafia LFG de Cienciar Penair.
35	146230-9681	Fri, 23 Oct 2009 19:00:(	00:00:31	2	1	Prof. MSc. Régis Schneider Ardenqh	21	http://fm-openlearn.open.ac.uk/fn	2	Defara Oral TeleVirtual de Manaqrafia LFG de Cienciar Penair.
36	c6394c-15558	Wed, 31 Mar 2010 14:00	00:00:31	0	0		24	http://fm-openlearn.open.ac.uk/fn	1	Defara Oral TeleVirtual de Manaqrafia LFG de Cienciar Penair.
37	a5a694-15370	Wed, 24 Mar 2010 14:0(	00:00:33	0	0		26	http://fm-openlearn.open.ac.uk/fn	3	Defara Oral TeleVirtual de Manaqrafia LFG
38	7bfee4-16303	Wed, 19 May 2010 19:0(	00:00:33	0	0		22	http://fm-openlearn.open.ac.uk/fn	1	Defara Oral TeleVirtual de Manaqrafia LFG de Cienciar Penair.
39	ca1f84-4935	Wed, 26 Nov 2008 17:0(	00:00:34	2	1	Guilherme	21	http://fm-openlearn.open.ac.uk/fn	4	Defara Oral TeleVirtual de Manaqrafia LFG de Direita Tributaria.
40	6110cf-14593	Mon, 22 Feb 2010 14:00	00:00:35	0	0		24	http://fm-openlearn.open.ac.uk/fn	2	Defara Oral TeleVirtual de Manaqrafia LFG de Direita Tributaria.
41	6a70ba-7204	Mon, 29 Jun 2009 20:0(	00:00:36	0	0		43	http://fm-openlearn.open.ac.uk/fn	0	Defara Oral TeleVirtual de Manaqrafia LFG de Cienciar Penair.

Figure 2: FM Metadata exported to an Excel file

Based on FM Metadata (Fig. 2), the quantitative data related to all web conferences were analysed to identify meetings attended, meetings replayed, meeting with chat, meetings 'duration, number of participants and frequency of bookings.

Approximately 4,648 events from 2008 to 2012 were booked by the UNISUL department of oral examinations support. These events include 3,462 oral examinations as well as 1,186 events not attended or attended by only one person. All participants were aware that meetings were recorded, could be replayed either by students or Institution. Approximately 60 percent of meetings (2,029) occurred without chat, which means participants could interact well using only the broadcast audio/video. In order to identify patterns and most frequent format of events, data analysis comprised the timelines of the shortest and longest exams with or without chat as well as with and more than two users. A few categories emerged, which were described in findings: short e-Viva with tests, short

interactive e-Viva without tests, long interactive e-Viva, long e-Viva with student's presentation, meetings with three participants and administration meetings. These categories were used to select random sets of events for qualitative analysis of the audio transcription, which allowed the detailed description of these six types of events and the elaboration of qualitative instruments: a semi-structured questionnaire with UNISUL University and a script for open interviews led by the Open University.

Therefore, qualitative analysis was sought to add insight to the quantitative data discussed above. In the context of formal examining, the intrusion of additional surveying was kept to a minimum; and it was felt that the staff experience was at least as important as the student experience of this process. Examined students were surveyed in two phases: firstly, a written semi-structured questionnaire was distributed by the UNISUL organization in 2013; secondly, the OU survey team contacted a small sample of students to conduct a series of open interviews.

The questionnaire was distributed to 100 students, sampled from the latest group of e-Viva exams in 2011–2012 to run through this system; and for the interviews five students agreed to take part in the more detailed qualitative follow up. The OU team also interviewed an additional seven UNISUL staff members involved in the e-Viva process: the programme coordinator, the technical support leader and five assessors. These open interviews discussed the interviewees reflections on the e-Viva processes which took place in 2012 and earlier, and all interviews were conducted in the latter half of 2013. A few categories emerged from the qualitative analysis of semi-structured questionnaires and open interviews with students: feelings, preferences, suggestions for examiners and recommendations for other students. Other categories emerged from the examiners' interviews: requirements for online exams, solutions used by students related to low internet connection and institutional benefits.

Findings

Based on quantitative data analysis of 3,462 FM web conferences, 90 percent refers to successful e-Viva meetings (3,147). Sixty three percent (1,990) were expected meetings whose duration varies from eleven to twenty minutes. While thirty seven percent (1,157) were short meetings—seven to ten minutes. This means that even due to any technical reason or delays, the shortest period of seven minutes was enough for a successful oral exam.

There were 3,202 e-Viva events, which took place with only two participants, the student and the examiner. A further 143 events were conducted with an additional attendee—typically either technical support person or a co-supervisor in attendance.

There were 32 coordination events for staff; and 85 technical events which took place during the surveyed period. Approximately 26 e-Viva events were booked per day, with two parallel meetings during the most popular time for participants: lunch time (11h00–14h00) and late evening (16h30–19h00).

According to the UNISUL coordinator, students were not supported by any prior training on the use of the system and relied upon "local technical support" for any difficulties encountered. Indeed, approximately 70 percent of students elected to take the e-Viva in a local University approved Learning Centre because it was quiet, and with a good quality, guaranteed internet connection. None of the students had used the system previously, but the majority (90 percent) reported that they found the system easy to use. Students who encountered problems were able to 'rebook' a new slot (e.g. where an event, which made them late for their booked slot, or where the 30 minute slot was taken up with too many technical issues).

Common e-Viva patterns

After selecting and analysing only the successful events (not used for testing, over ten minutes duration and with at least two participants), it was possible to identify six common patterns:

(1) Short e-Viva with tests: These online meetings comprise four minutes of tests and introduction, then seven minutes of questions and answers and finally less than one minute of communication of results. Figure 3 shows a student (Melissa) interacting with her examiner (Deisi). The event started at 11min. 5s., Deisi and Melissa started testing her equipment, then Deisi asked two questions (Q1, Q2), Melissa replied each question during approximately two minutes (A1, A2).

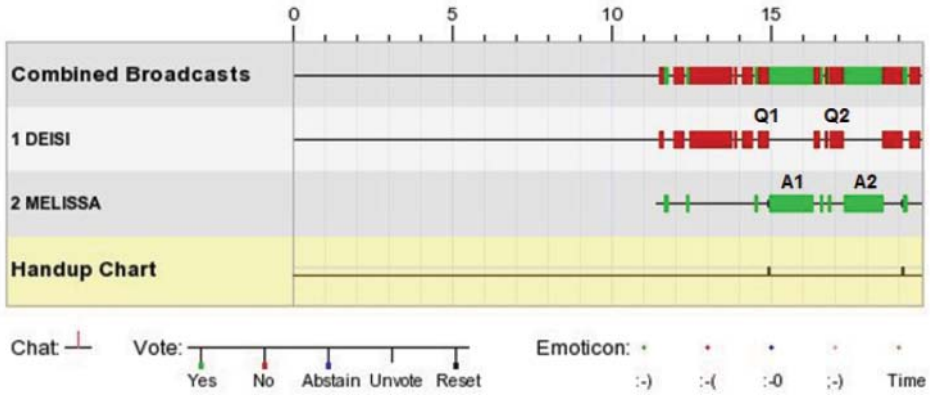

Figure 3: Short e-Viva with tests

(2) Short interactive e-Viva without tests: These online meetings comprise ten minutes of several questions and answers with less than one minute of communication of results. Figure 4 shows a student (Julio) interacting with his examiner (Fabio). The event started late at minute 20, but soon Fabio and Julio realised that their equipment was fine. Fabio presented six questions which were replied by Julio fast (with answers less than one minute). The online exam lasted approximately 7 minutes.

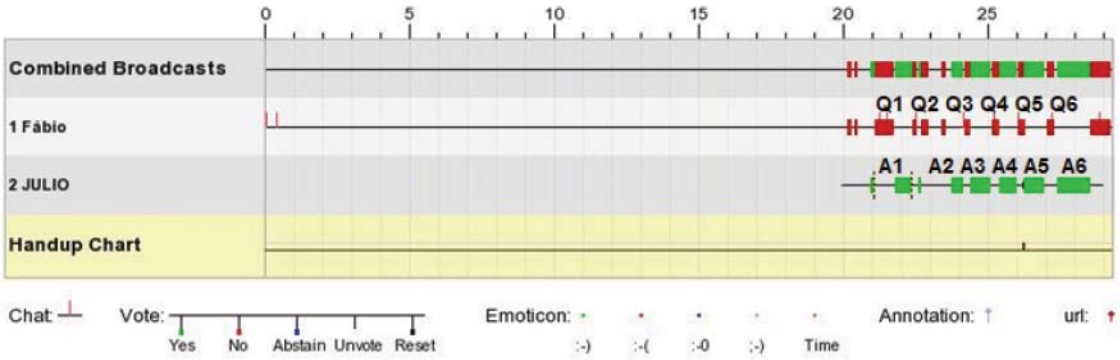

Figure 4: Short interactive e-Viva without tests

(3) Long interactive e-Viva: These online meetings consist of 15 to 20 minutes with several questions and answers with less than one minute of communication of results. The example presented through Figure 5 shows a student (Leonardo) interacting with his examiner (Prof. Andre). The event started at minute 0, Prof. Andre presented seven questions with comments, which were replied by Julio with less than one minute answers.

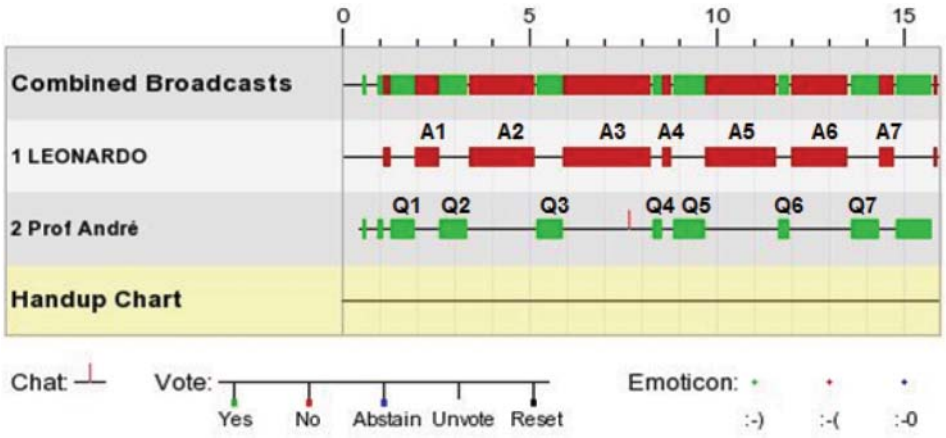

Figure 5: Long interactive e-Viva

(4) Long e-Viva with student's presentation: These online meetings consist of 20 minutes in total with student's presentation followed by questions and answers. Figure 6 shows that during the first two minutes, the student Daniela and examiner Prof. MSc Susana tested their equipment. Daniela then presented her work in ten minutes. During the next seven minutes of interaction, the examiner Susana asked two questions which were replied by Susana. The last minute the examiner presented the result and the student shared her feedback about the assessment.

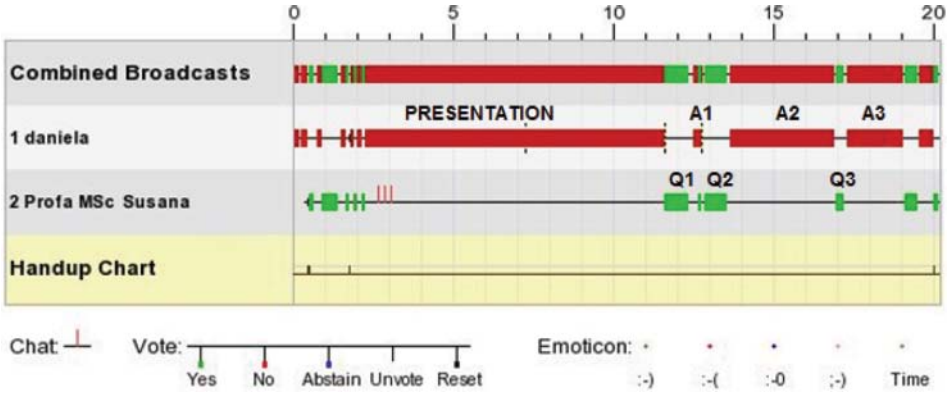

Figure 6: Long e-Viva with student's presentation followed by questions and answers

(5) Meetings with three participants: student, supervisor and examiner: These online meetings were rare. Figure 7 shows the student (Marco) his supervisor (Dr. Antonio) and the examiner (Carlos). During the first eight minutes, the student Marco presented his work, the supervisor Antonio then shared comments about the written work, in which some paragraphs should be

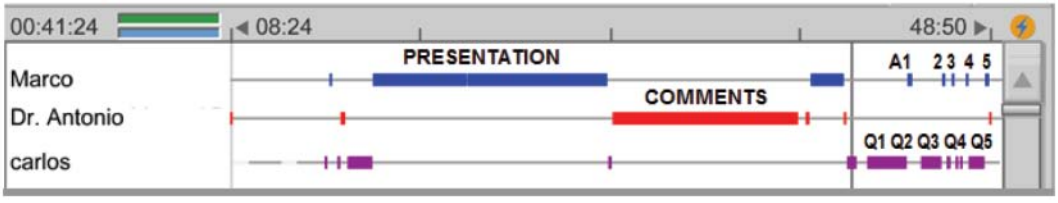

Figure 7: Long e-Viva with 3 participants (student, supervisor and examiner)

presented as a quote with student's comments and interpretation. Student agreed with all changes. Examiner Carlos presented a few questions, which were replied by the student correctly. He was then approved after resubmission of his written work.

(6) Administration Meetings These online meetings lasted one hour. Figure 8 shows the person responsible for booking the exam meetings (Vinicius) discussing with all the other five Units in Brazil for scheduling the period of FMs for each group of student.

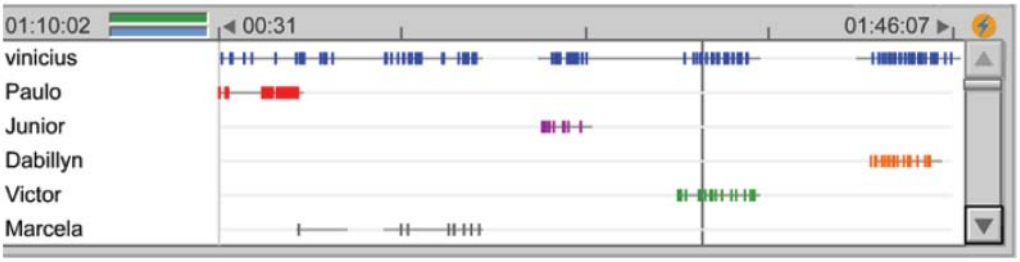

Figure 8: Administration Meetings

Outcomes from qualitative data analysis were grouped in two categories: the student and Institution view.

The student view

Students were clearly aware of the barriers inherent in this approach. For example, some interviewees clearly felt that this format was not entirely satisfying, and that a face-to-face alternative might have offered an opportunity for them to perform better.

> *"I think that if the viva was F2F we would probably have more time to discuss my work, with more questions and more discussion in depth. I am not sure if my work was fully read and analysed by the examiner. I think that time for answering the questions was very short and the experience was not good as I expected"* (Student 7).

A few students mentioned that the test seemed to be over very quickly, and based on the questions they were not satisfied that the examiners had fully appreciated all their work. But most focus on barriers was technical—with a good internet connection a common challenge.

> *"I had problems with low connection, but it was possible to complete the viva".* (Student 7)

However, students were also acutely aware of the benefits. Most interviewees were generally positive about the experience and the majority felt that it was a good opportunity for them to perform, even relative to the face-to-face alternative.

> *"I do not have a particular preference. Both modalities are fine for me. I feel that there is no difference. However, although I would feel confident in attending either online or F2F events, I think that most students might be more nervous in F2F assessments with the physical presence of the examiner observing the students all the time".* (Student 5)

Some students noted that it might even be an improvement in relationto the physical meeting.

> *"I definitely prefer an online viva instead of a F2F oral assessment. The reasons are the interaction with examiner is fast and objective. It is possible to attend the event anywhere through the Internet and webcam without any technical experience. I can focus on the answer to the question without looking at the examiner's face and feeling worried."* (Student 6)

In terms of feelings, students picked up on a number of issues around the virtual viva event. Students who felt it was a good experience reflected on the challenge of the general viva, and the need to

focus on their performance as already very challenging. Students were certainly aware of the additional technical challenges they faced in using video for interacting with their University and felt that this was more likely to be the cause of problems than the event format.

> *"The only problem, that might be a disadvantage for online, is if there are technical problems".* (Student 3)

And having quickly accepted the format potential, students were able to offer advice to others facing the same challenge,

> *"My recommendations for students are keep calm, feel confident and study the written work before the assessment".* (Student 1)

Students generally noted that ". . . *it is normal to feel worried*. . ." but also noted that the online format allowed them a feeling of a *"*. . . *less pressure and less formal*. . ." space to answer the questions posed by the examiner than the face to face context would allow. The issue of confidence was picked up by most interviewees, who noted that they perhaps ". . . *felt more confident answering questions through web conference than face to face*. . .", because they were more focused on replying to the question than paying attention to the examiner's reaction. In some senses they felt that the physical presence of the examiner is somehow more distracting than the virtual presence, and would reduce their confidence.

Students commended on the assessment's practicality, particularly in terms of location (that they could participate in the meeting from home, at a learning centre or somewhere else convenient—some interviewees had attended the FM at an internet café close to their home). Students also mentioned flexibility, noting that in case of problems, the exam event could be quickly booked soon again. One student noted that this method seemed to be very efficient—providing them with a very fast way to complete the exam and obtain feedback.

The institutional view

Examiners were also aware of the objectives of the FM e-assessment as a quality control mechanism essential as a requirement of the Brazil Government for Distance Education postgraduate course. Examiners were also committed to run the e-Exam successfully, by:

- Testing webcam and audio**.**
- Allowing seven to fifteen minutes for students to talk about the content**.**
- Contacting the technical support in case of problems with audio**.**

Some of them tested the system. All of them mentioned that they did not receive any formal training in this new medium. Most of them conducted their side of the exam at the University Centre. Some of them attended the exams from their homes or other working places.

Indeed, there were some problems noted by the examiners, in particular the internet unreliability in parts of Brazil. In addition, there were concerns raised about changing dates with very short notice. Updating the system was very easy, but it was inconvenient for the examiners. Other concerns were related to conducting the online oral exam in a noisy place, such as "LAN houses" where sometimes it was not easy to hear the student over the background noise, but even in these cases the exams were completed without any serious problems. Indeed, their experience was generally very positive:

> *"The online viva was a successful experience in UNISUL—LFG. Online assessments are objective, with good outcome in a short time; therefore they are very productive time for both examiners and students."* (Examiner 1)

The internet connection was seen as challenging, but not a significant barrier to the overall process:

> *"The technology and requirements are simple, it is not necessary to have technical support for most of the events—the participants' autonomy is therefore high."* (Examiner 1)

The technology was seen as very positive with respect to supporting an efficient and reliable e-Viva process:

> "*Even with technical problems (which were very few and most of them related to low internet connection), it is possible to assess students very fast. It is a safe system because it is possible to check identity and had simple technical requirements. It is very suitable for Distance Education Institutions."* (Examiner 2)

Overall, the examiners focused on a very few general issues (a) that the event offered a significant cost saving with respect to transport, time and location; (b) that it was very flexible, as the exam can be provided anywhere—any time; (c) that it offered a very reliable and fast way to run the exam (in parallel) and (d) to offer almost instant feedback.

Discussions and recommendations

The literature presents a few studies on proctored testing. Some of these studies show that an on-line course with proctored testing was more effective in promoting learning when compared to an on-line course with un-proctored testing (Wellman, 2005; Picciano, 2002). Various reasons were identified from the students' perception: "face validity", reinforcement of examination process and clarification of questions. However, in these studies, the exams still occur in the same place for all students and assessors. This is not feasible for MOOCs or online assessments in countries with a vast territory such as Brazil. A key factor for large scale assessment programmes is the testing infrastructure, which includes: test development, delivery, financial services, registration and scheduling and information management. The infrastructure must be reliable and scalable, so that as the number of tests delivered increases the system is able to support this growth (Wynne & Lopes, 2006).

In this work, we focused on in-depth research on the use of FM in online courses at scale for postgraduate certification in Law in Brazil. We have argued that the use of an effective web videoconferencing for proctoring online oral exams provides high quality assurance. Findings in this study highlighted various benefits for Institutions, examiners and students such as: reliable examination, credible technology, authentic assessment, interactive e-Viva, low cost, scalable process and practical testing in terms of time, effort and money.

This study presents some recommendations drawn on quantitative and qualitative data for students, assessors and Institutions for effective use of web videoconferencing in online courses at scale:

1. Institution:
   - Selecting an easy-to-use technology for online exams that does not require training and allows recording of the event as a way to keep evidence of the exam.
   - Providing clear instructions about the exams to students related to both written and oral exams: purpose, requirements, recommended venues (e.g. quiet and good web connection) and criteria for approval (in order to confirm identity and authorship)
   - Clarifying the minimum requirements for assessors related to quality assurance (e.g. successful interaction with audio, webcam and/or chat), minimum and maximum time, flexibility for choosing best format of the oral exam based on the circumstances (e.g. long or short time after delays or technical problems).

2. Students:
    - Being aware of the overall requirements and recommendations provided by institution as well as other factors that influence the exam: punctuality, minimum equipment (computer, webcam and audio), good web connection
    - Addressing questions with objective answers and being prepared to interact in a short time in case of any initial problem (e.g. 10 minutes)
    - Being prepared to interact online by feeling calm and confident to demonstrate knowledge and focusing on questions not on the examiner's physical reaction.
3. Examiners:
    - Being able to select the most suitable format of online exams (e.g. Short e-Viva with tests, interactive e-Vivas without tests, long e-Vivas with presentations, . . .)
    - Being prepared to interact not only through audio but also chat (e.g. copying/pasting questions to the chat in case of any technical problem)
    - Providing clear questions and instant feedback, and interrupting if necessary (FM option to stop and reinitiate the broadcasting) to keep the exam very objective and efficient.

Limitations and future work

To improve external validity, this research should be extended to multi-case studies at scale with participants of different nationalities. The FM technology has already been used in various countries in the last decade including multicultural and global projects, but all studies at small-scale: reflective learning (Wodehouse & al., 2007), peer-to-peer learning (Scott, Castañeda, Quick & Linney, 2009) and real-time language assessment (Hopkins, 2011).

In this naturalistic study in Brazil, the quantitative analysis of a large metadata set of FM events related to four years allowed us to identify common patterns of different formats of online exams. The full audio recording of a representative set of events related to each format allowed us to develop qualitative analysis in depth as well as prepare further surveys and interviews with respective examiners and students.

Our next work focuses on the use of FM in the European project ENGAGE, which offers MOOCs as a strategy for teachers' continual professional development. ENGAGE includes fourteen Institutions in thirteen countries. Its purpose is to equip the next generation of students and teachers for active engagement in science through a more inquiry-based methodology and responsibility to come to informed decisions by reaching more than 12,000 teachers in Europe and 360,000 students. This research in progress investigates barriers and recommendations to foster teacher's communities of practice through Open Educational Resources (engagingscience.eu) integrated to MOOC (engage.exactls.com). The FM web videoconferencing application will be used in various ways for learning and assessment.

Conclusion

This study demonstrated that even in a challenging distributed learning context such as the one in Brazil, with low internet connectivity in widely distributed and isolated settlements, online video-conferencing technology was used effectively as a quality assurance mechanism in a scaled, low cost and flexible way.

Findings in this study indicated that the main benefit was the high quality provided by these examinations with FM as a cost-effective alternative to F2F viva. Both examiners and students found e-Viva a reliable method for verifying student's competence in writing their dissertation and

knowledge authorship on the field. Examiners were confidently able to rule on a student's identity, knowledge, and ownership of submitted work in a short time. The average assessment length was seven minutes of remote video interaction. The majority of students interviewed and surveyed indicated various benefits of the online exam through FM: they were more focused on the questions instead of the physical presence of the assessor; they liked the flexibility related to location for assessment and found the technology easy to use.

With regard to challenges, the key barrier was low connection in certain areas selected by students. This was pointed out by both examiners and students. However, all of these cases were solved by rebooking the online exam in a different venue.

This large-scale study has clearly demonstrated the advantages of a well-designed use of the e-Viva at scale to complement a distance study programme, as well as provided some key recommendations for institutions, examiners and students.

This event design did not require any significant investment in human proctoring. Student identity was easily checked via video which was recorded, and 'cheating' was very unlikely in this context, so the exam was both demonstrably of good quality and well standardized. Our next work will focus on a multicultural context of FM applied to assessment in multilingual MOOCs.

Acknowledgements

The authors would like to acknowledge the support of the Knowledge Media Institute and UNISUL University. The authors are very grateful to Kevin A. Quick, Jon Linney responsible for the technical development of the FM video conferencing tool, Chris Valentine who provided support with metadata extraction as well as all students and viva examiners from Brazil who participated in our interviews and surveys.

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